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CAE structures library

UG-0023

FIXMOOR USER'S GUIDE

BETA VERSION

FIXED MOORINGANALYSIS

by

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October 1989

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PREFACE

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CONTENTS

INTRODUCTION

This manual presents a description of the Fixed Mooring Analysis Program and the various files used in conjunction with the program. The capabilities are summarized so the user will understand under what conditions the program is useful. A section is included to give the user an understanding of how the specific load conditions are considered. A set of assumptions and guidelines are also presented to assist in setting up specific ship/pier configurations for computer modeling. Procedures are detailed for entering data and appendices are included for sample problems, ship properties characteristics, fender load-deflection data, and mooring line elongation characteristics.

BACKGROUND

The DM26 series design manual describing design procedures for fixed and fleet mooring was updated by Moffat and Nichol. They developed a computer program to perform the improved computations.

The program described in this manual is the fixed mooring portion of the original Moffat and Nichol program. The program has been enhanced to provide improved features. The fleet mooring portion of the original program has been superseded by a new program known as FLEETMOR*.

PROGRAM DESCRIPTION

The Fixed Mooring Analysis Program (FIXMOOR) analyzes the wind and current forces on ships moored to a pier and determines the resulting mooring line forces and lengths and the fender forces and deflections or set-offs. The program is based on the ship motions of yaw, sway, and surge as being the predominant motions affecting a ship moored to a pier. This program follows the general steps of:

a. Reading the ship characteristics based on Table 2 of DM26.6.

b. Reading the water depth and tide height.

c. Reading the fender type and its load-deflection characteristics and position with respect to the ship-pier geometry.

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*Naval Civil Engineering Laboratory. Technical Memorandum TM-44-86-01: Fleetmor static mooring analysis model users manual, by P. A. Palo and S. R. Karnoski. Port Hueneme, CA, Jul 1986.

d. Reading the mooring line type, its percent load-elongation table, breaking strength, preload, and position in the ship-pier geometry.

e. Calculating the mooring line load-distance curve for the specific ship-pier geometry and tide height.

f. Reading the environmental wind and current conditions to be analyzed.

g. Calculating the environmental forces and moments on the specific ship for the given wind and current conditions. The program provides the user with two options for calculating the environmental forces.

Option 1: This option has the program calculate the forces directly by specifying the wind and current speeds and directions. This option calculates the forces by the method presented in DM26.4

Option 2: This option enables the user to calculate the environmental forces on the ship by any method of his choice prior to using the program and providing the forces directly as input data.

The Newton-Raphson iteration procedure is employed to determine the equilibrium condition of the ship subjected to the environmental loads. This procedure is used because of the nonlinear force-elongation and force-deflection behavior of the mooring lines and the fenders. The environmental forces and moment due to wind and current cause the ship to change position. The movement of the ship is constrained by the mooring lines, and under certain conditions the fenders between the ship and the pier. This movement causes the restraint system components to stretch or compress. This elongation or deflection relates to the mooring line and fender forces via the respective nonlinear force-elongation or force-deflection relationships. To achieve an acceptable solution, the restraint system force and moment components must balance, within prescribed tolerances, the environmental force and moment components. The Newton-Raphson procedure uses the previous equilibrium condition to predict the next equilibrium condition making appropriate corrections until equilibrium between the restraint forces and the environmental forces is achieved.

Data Input/Output Files

The problem dependent input and output files are FIXMOOR.DAT and FIXMOOR.OUT. The file FIXMOOR.DAT is used to input the locations of the pier mooring points, mooring line types, fender locations, fender types, and environmental conditions and tolerances. The output file, FIXMOOR.OUT, contains the analysis results for the specified loading conditions. An example of both the input file (FIXMOOR.DAT) and the output file (FIXMOOR.OUT) are contained in Appendix A. These files can be renamed (see Output Redirection) with a file name that identifies the project.

Other Files

There are also other files needed to run the program. They are the ship characteristic file, the fender load-deflection file, the mooring line percent elongation file, and an optional environmental force file. The format of these files is discussed in Appendices B, C, D, and E respectively.

The ship file contains descriptive ship characteristics that include the length at waterline, draft, beam, displacement, etc., needed to calculate the applied loads. A ship file is accessed by specifying the ship class (e.g., CV, DD, FF, etc.) and the hull number.

The fender files contain load-deflection values for a particular type of fender that can be distinguished by manufacturer or material. A load-deflection file is accessed by specifying a fender file name in the input file (FIXMOOR.DAT). This load-deflection (stiffness) data is used in the main program to calculate the fender loads and deflections due to the applied environmental loads.

The mooring line percent elongation files contain the percent elongation for load increments equal to 5% of the breaking strength. The data must contain 21 data points and the first point must be zero. A mooring line file is accessed by specifying the file name in the input file (FIXMOOR.DAT).

The optional environmental force file contains the forces and moment, and their tolerances for the specific ship and environment to be analyzed. It provides the user with the option of determining the forces by his own methods instead of using the DM26.4 procedures. To use this feature specify the variable NL equals zero on the Data Line N in the FIXMOOR.DAT file and provide the FORCE.DAT file as specified in Appendix E.

PROGRAM CAPABILITIES

For an analysis of a single ship and pier combination, the program can handle the following:

Analysis Item	Maximum Number
Mooring Lines	21
Mooring Line Material Types	11
Fenders	11
Load Cases (environmental conditions)	50

The FIXMOOR analysis procedure is applicable to one moored single-hulled vessel at a time. Catamarans and nested ships cannot be analyzed with this program. The program operates with engineering units of pound-feet.

Mooring Lines

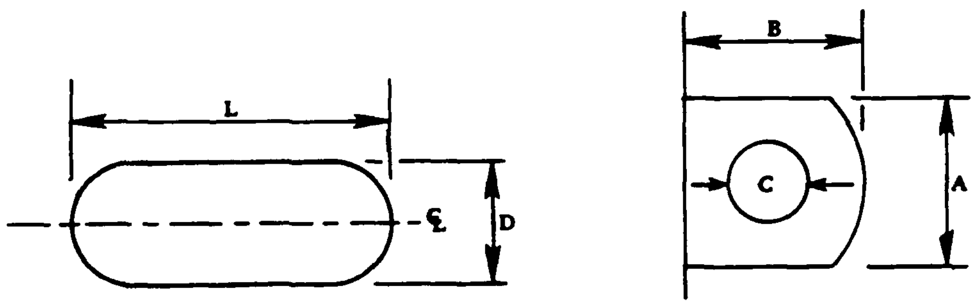
A material type must be specified for each mooring line. The mooring line data input files presently contain values for steel, nylon, and polypropylene.

The program will handle mooring lines with different characteristics for a particular ship and pier combination. Textile mooring lines do not have a tail length. If steel wire is to be used, then specify steel and provide the elastic modulus, the cross-sectional area, breaking strength, and preload. The breaking strength for steel wire mooring line is the breaking strength of the textile tail. The program will calculate the other necessary information from these data.

Fenders

A fender file name must be specified to generate the load-deflection characteristics for all the fenders in the given ship and pier configuration. For the same ship and pier configuration the program will handle eleven fender types. Presently, the program has the following fender files:

Fender type	File Name
Foam 6x12.5 at 60% compression	RUBMIL.DAT
Foam 6x14 at 60% compression	SEAWARD.DAT
Rectangular extruded rubber 7x10x3	EXTRUB1.DAT
Rectangular extruded rubber 10x10x4	EXTRUB2.DAT
Rectangular extruded rubber 12x12x5	EXTRUB3.DAT
Rectangular extruded rubber 14x14x6	EXTRUB4.DAT
Rectangular extruded rubber 20x20x8	EXTRUB5.DAT
Steel Pile (16 WF 100) with a 36 inch diameter wood camel	STPILE.DAT



Foam fender
Size notation convention is DxL

Rectangular extruded rubber fender
Size notation convention is AxBxC

Figure 1. Fender geometry for foam filled and rectangular extruded rubber fenders.

Ship Characteristics

For the ship being analyzed, the ship class and hull number must be specified to access the appropriate ship characteristic file. The program handles the ship characteristics described in Appendix B. The ship property files presently available are for aircraft carriers (CV), battleships (BB), destroyers (DD), cruisers (CA), frigates (FF), and amphibious assault ships (LHA).

Load Cases

The program will solve up to a maximum of 50 different load cases for a given ship and pier configuration. For each load case the following information is required:

- Environmental conditions: current speed (knots), current direction (deg), wind speed (mph), wind direction (deg), are used to calculate the applied horizontal (surge), vertical (sway), and moment (yaw) loads.

- Convergence tolerances for X and Y forces and the Z moment

The specified tolerances are provided to determine when the iterative procedure is to stop and the answers are acceptable. If zero values are specified the program calculates a tolerance based on the input environmental loads. The sign convention (Figure 2) used for the environmental loads is critical and will be discussed in the Sign Convention section.

Sign Convention

In using the program two sign conventions are used: one for the geometry and one for the forces. Figure 2 shows a diagram of the ship and pier geometry and the positive directions for the environmental forces. The following angles are all measured from the original ship heading (positive x-axis).

SYMBOL	ANGLE	POSITIVE DIRECTION
θ	Yaw	counter clockwise
	Fender reaction angle	counter clockwise
	Mooring line angle	counter clockwise
ϕ_1	Wind direction	clockwise
ϕ_2	Current direction angle	clockwise

In order to interpret the results correctly, these sign conventions must be followed.

Output Interpretation

In reading the output results, the output section entitled "Initial Position No Environmental Loads" includes the load effects of both mooring line preloads and tide height. Should the fender results specify a zero horizontal reaction and a value is given for deflection/set-off, this value is the distance the ship is set-off from the fenders. The reaction angle for such a condition is the line of action perpendicular to the ship through which this set-off is measured.

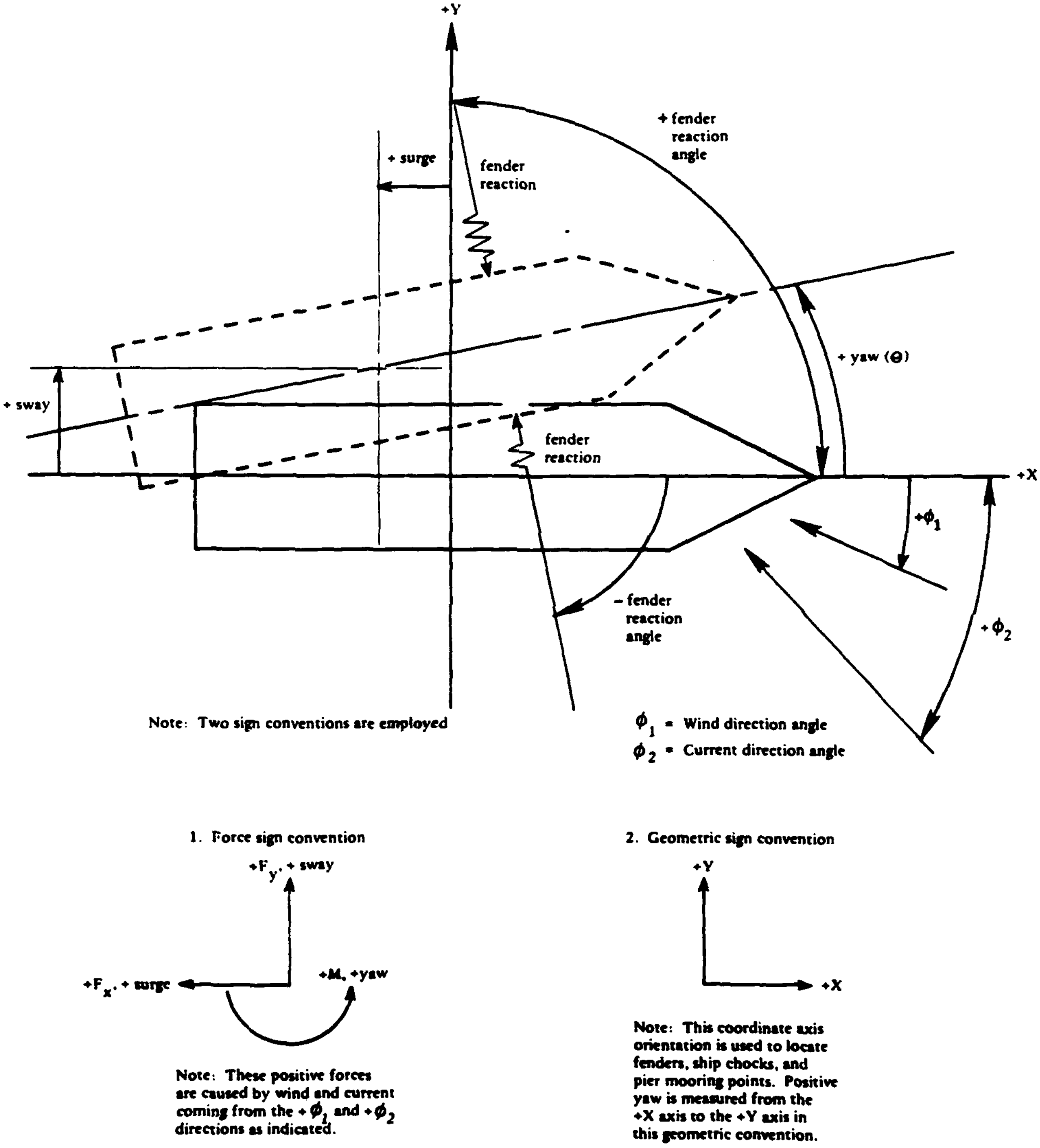


Figure 2. Sign convention.

Parametric studies have indicated that output results can demonstrate significant variation with seemingly insignificant variation of input parameters.

PROBLEM DATA PREPARATION INSTRUCTION INPUT REQUIREMENT

To run the program, the input file FIXMOOR.DAT is required. In developing the input file character strings are left justified and numerical values are right justified. The following parameters are required:

Data Line Type A - Ship class.

Variable	Column	Description
SHIPCL	1-8	Ship class which accesses a particular file. For example SHIPCL = CV will access the aircraft carrier (CV) file.

Data Line Type B - Ship designation.

Variable	Column	Description
SHDESIG	1-6	Ship designation which writes the type of ship within the specified ship class. For example; SHDESIG = FFG writes ship designation: FFG None may be entered if a designation is not applicable.

Data Line Type C - Specific ship hull number.

Variable	Column	Description
HULLNO	1-5	Hull number which accesses the specific ship data within the ship class. This value must be right justified.

Data Line Type D - Mooring side designation.

Variable	Column	Description
PS	1-5	Ship mooring side designators: STBD for the starboard side, PORT for the port side

Data Line Type E - Water depth.

Variable	Column	Description
WD	1-5	Z coordinate (ft) between the mudline and the water surface.

Data Line Type F - Tide height.

Variable	Column	Description
ZT	1-5	Z coordinate (ft) between the tide datum and the water surface. The tide datum selected depends on the situation to be modeled. It is suggested to use either the low conditions (mean low water (MLW) or mean lower low water (MLLW)) or the high conditions (mean high water (MHW) or mean higher high water (MHHW)) depending on conditions to be analyzed.

Data Line Type G - Maximum number of fenders.

Variable	Column	Description
NF	1-5	Maximum number of fenders used in the analysis.

Data Line Type H - Fender number and location.

Variable	Column	Description
I	1-5	Fender number
XF	11-20	X coordinate of fender (ft)
YF	21-30	Y coordinate of fender (ft)
FENTYP	31-40	Name of fender file which contains the specific fender load-deflection data.

Data Line Type I - Pier Mooring Points.

Variable	Column	Description
MP	1-5	Number of pier mooring points.

Data Line Type J - Pier mooring point coordinate.

Variable	Column	Description
MPN	1-5	Mooring point number.
X1	11-20	Mooring point X coordinate (ft).
Y1	21-30	Mooring point Y coordinate (ft).
Z1	31-40	Mooring point Z coordinate (ft).

Data Line Type K - Mooring lines.

Variable	Column	Description
N	1-5	Number of mooring lines.

Data Line Type L - Mooring line definite.

Variable	Column	Description
LN	1-5	Mooring line number.
CN	6-10	Chock mooring point number.
PN	11-15	Pier mooring point number.
MATYPE	21-28	Mooring line material types: STEEL, POLYPRO, NYLON. This is the same name used in the mooring line file name.

Data Line Type M - Mooring line properties.

Variable	Column	Description
J1	1-5	Mooring line number.
LD	11-20	Horizontal length of the mooring line between the ship-chock and the attachment point on the ship's deck. This value determines the actual length of the mooring line from pier attachment point to ship attachment point.
TL	21-30	Length (ft) of synthetic portion of a steel wire mooring line. This value applies to cases where steel wire mooring lines are analyzed. For textile mooring lines set TL = 0.
BS	31-40	This is the breaking or ultimate strength (lb) of a particular mooring line. For steel wire mooring lines this is the breaking strength of the synthetic line tail.
PL	41-50	This is the preload (lb) on a mooring line before any environmental loads are applied.
ES	51-60	This is the elastic modulus (psi) of a steel wire mooring line. This value applies only for steel wire mooring lines.
AC	61-70	This is the cross-sectional area (sq-in) at a steel wire mooring line. This value applies only for steel wire mooring lines.

Data Line Type N - Maximum number of load cases + 1.

Variable	Column	Description
NL	1-5	Maximum number of load cases plus a value of 1. For example, if there are 5 load cases to be analyzed, the value to be entered would be 6. To input the environmental forces directly enter NL=0 and provide a FORCE.DAT file.

Data Line Type O - Load cases.

Variable	Column	Description
J2	1-5	Load case number: this is the load case plus a value of 1. For example, the load case number for the third load case would be entered as 4.
CSS	11-20	This is the average value of the current velocity profile between the water surface and the ship's keel (knots).
CAA	21-30	This is the angle (degrees) of the current about the center of the ship taken clockwise from the bow of the ship.
WS	31-40	This is the speed of the wind at 33 feet above the water surface (mph).
WA	41-50	This is the angle (degrees) of the wind about the center of the ship taken clockwise from the bow of the ship.
TX	51-60	This is the allowed X and Y force (lb) tolerance for equilibrium convergence.
TM	61-70	This is the allowed moment (ft lb) tolerance for equilibrium convergence.

Specific Assumptions/Guidelines

There are several assumptions and guidelines that the user should be aware of in order to model a specific situation correctly. These conditions are summarized as follows:

- Single-hulled vessels only (no catamarans or nested ships).
- Mooring line preload must never be negative.
- Mooring lines are assumed to be weightless.
- Ship chocks are assumed to be frictionless.

- All fenders must initially be in contact with the ship.
- The sign convention must be followed correctly.
- The applied loads remain constant during changes in ship position and orientation.
- Floating piers are not acceptable.

EXECUTION INSTRUCTIONS

The program is designed to run on an IBM PC compatible personal computer having at least 512 K memory and a math coprocessor. There are a number of ways to execute the program, each will be discussed.

Installation

The FIXMOOR program is provided on a single diskette. The diskette contains:

FIXMOOR.EXE	The executable program.
EXPIER.DAT	The example problem input file.
RUNFIX.BAT	The batch execute file.
EXPIER.OUT	The example problem output file.

The following libraries are also included:

Ship library

BB.DAT	Battleships	Ship chock coordinates, superstructure area and height, and hull area and height are dummy values.
CG.DAT	Cruiser	
DD.DAT	Destroyer	
FF.DAT	Frigate	
CV.DAT	Carrier	
LHA.DAT	Amphibious Assault Ship with Carrier drag coefficients	

Fender library

EXTRUB1.DAT
EXTRUB2.DAT
EXTRUB3.DAT
EXTRUB4.DAT
EXTRUB5.DAT
SEAWARD.DAT
RUBMIL.DAT
STPILE.DAT

Mooring Line library

NYLON.DAT
POLYPRO.DAT
STEEL.DAT

A sample FORCE.DAT file named EXFORCE.DAT, is also included as an example of a user supplied force file.

These files should be copied to the hard disk or to another floppy disk before the program is used. The standard DOS COPY Command can be used.

```
COPY A:*.* C:  For the hard disk
COPY A:*.* B:  For the floppy disk
```

The program is now ready to run using one of the methods described below.

Standard Execution

The standard way of executing the program involves preparing an input file and running the program with the print output going to a file. The program assumes the input data is contained in the file FIXMOOR.DAT. The data can be prepared using any line or screen editor program, such as the DOS EDLIN editor. The user should prepare this file using the FIXMOOR.DAT file name, or the input can be prepared using any file name then copying the prepared file to FIXMOOR.DAT by using the standard DOS COPY Command. In addition a ship data file, a fender load-deflection data file, and a mooring line percent elongation data file are required as a minimum to run the program. Should the user want to input his own forces then an additional file FORCE.DAT is required. Examples of these data files are in the appendices. The program will write the print output to FIXMOOR.OUT. The FIXMOOR.OUT file can be printed using the standard DOS PRINT Command.

The program, FIXMOOR.EXE, is executed by typing FIXMOOR.

Output Redirection

The user can use the DOS SET Command to redirect the output. The default input and output file names can be changed by:

```
SET FIXMOOR.DAT = %1.DAT
SET FIXMOOR.OUT = %1.OUT
SET FORCE.DAT   = %2.DAT
```

Then the program can be run by the FIXMOOR command. CAUTION: The DOS redirection mechanism is active for the duration of the run of the program only. The SET Command stays set until the connection is broken in the following manner or through a system reboot:

```
SET FIXMOOR.DAT =
SET FIXMOOR.OUT =
SET FORCE.DAT   =
```

Batch File Execution

The program can be run with a batch file. For example, the batch file might be called RUNFIX.BAT, and it would contain:

```
SET FIXMOOR.DAT = %1.DAT
SET FIXMOOR.OUT = %1.OUT
SET FORCE.DAT   = %2.DAT
FIXMOOR
SET FIXMOOR.DAT =
SET FIXMOOR.OUT =
SET FORCE.DAT   =
```

The program would then be executed by the command:

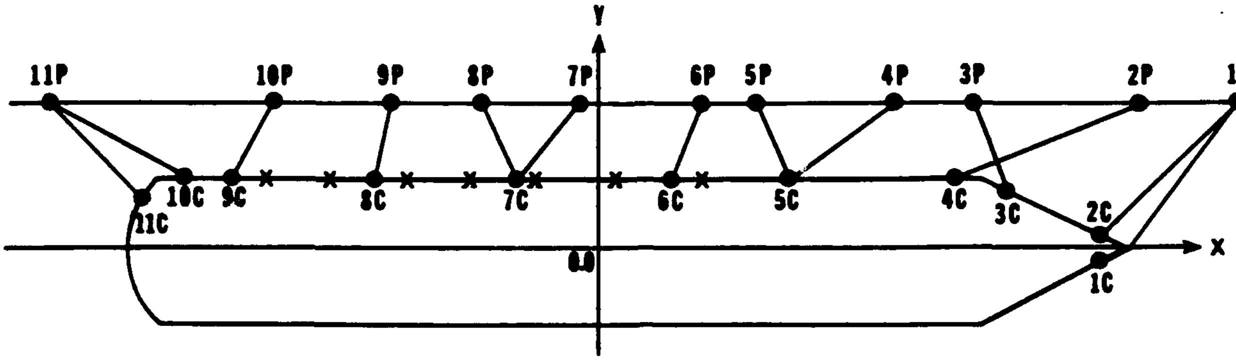
```
RUNFIX <your data file name> <your environment force file name>
```

ACKNOWLEDGMENT

Appreciation is expressed to Mr. Hugo Conti of OMCB Consultants, Carpinteria, California, who converted the original program from Microsoft GBASIC to FORTRAN77. He also provided extensive analysis of the program and enhancements.

Appendix A

EXAMPLE PROBLEM



Ship Chock	Chock Coordinates	Pier Point	Pier Coordinates	Fender ℄ ⊙ x	Fender Coordinates
1C:	410.0, -4.0, 59.5	1P:	540.0, 62.25, 17.24	F1:	80.0, 53.0
2C:	410.0, -4.0, 59.5	2P:	412.0, 62.25, 17.08	F2:	10.0, 53.0
3C:	379.0, 48.5, 59.5	3P:	330.0, 62.25, 16.98	F3:	-60.0, 53.0
4C:	334.0, 53.0, 59.5	4P:	245.0, 62.25, 16.88	F4:	-130.0, 53.0
5C:	176.0, 53.0, 42.5	5P:	138.0, 62.25, 16.72	F5:	-200.0, 53.0
6C:	35.5, 53.0, 14.7	6P:	77.0, 62.25, 16.67	F6:	-270.0, 53.0
7C:	-48.0, 53.0, 42.5	7P:	-8.0, 62.25, 16.57	F7:	-340.0, 53.0
8C:	-251.5, 53.0, 14.7	8P:	-90.0, 62.25, 16.47		
9C:	-391.0, 53.0, 58.2	9P:	-259.0, 62.25, 16.36		
10C:	-404.0, 53.0, 58.2	10P:	-343.0, 62.25, 16.07		
11C:	-410.0, 31.0, 58.2	11P:	-470.0, 62.25, 16.00		

<u>Given</u>:

Ship: LHA 1
Water depth = 37.4 feet
Tide height = 0.0 feet

Fender data
Maximum number of fenders = 7 (location of fenders above)
Fender type: steel pile (16wf100) with a 36 inch diameter wood camel

Mooring line data
Maximum number of mooring lines = 13
Mooring line type: nylon (location of mooring lines above)
On-deck length = varies (see Output)
Breaking strength = 159,300 lbs
Preload = 500 lb (all lines)

Load case data

Maximum number of load cases = 9

Load Case	Current Speed (Knots)	Current Angle (Deg)	Wind Speed (mph)	Wind Angle (deg)
1	0.09	120.0	46.0	87.0
2	0.10	120.0	46.0	87.0
3	0.11	120.0	46.0	87.0
4	0.09	120.0	46.0	110.0
5	0.10	120.0	46.0	110.0
6	0.11	120.0	46.0	110.0
7	1.0	120.0	46.0	87.0
8	1.0	120.0	46.0	110.0
9	2.0	120.0	46.0	87.0

EXAMPLE PROBLEM INPUT FILE (FIXMOOR.DAT)

```
     |                                    COLUMN
LINE |         1         2         3         4         5         6         7         8
TYPE |12345678901234567890123456789012345678901234567890123456789012345678901234567890
-----+--------------------------------------------------------------------------------
A    |LHA
B    |LHA
C    |    1
D    | PORT
E    | 37.4
F    |  0.0
G    |    7
H-1  |    1           80.0      53.0     STPILE
H-2  |    2           10.0      53.0     STPILE
H-3  |    3          -60.0      53.0     STPILE
H-4  |    4         -130.0      53.0     STPILE
H-5  |    5         -200.0      53.0     STPILE
H-6  |    6         -270.0      53.0     STPILE
I    |   11
J-1  |    1          540.0     62.25     17.24
J-2  |    2          412.0     62.25     17.08
J-3  |    3          330.0     62.25     16.98
J-4  |    4          245.0     62.25     16.88
J-5  |    5          138.0     62.25     16.72
J-6  |    6           77.0     62.25     16.67
J-7  |    7           -8.0     62.25     16.57
J-8  |    8          -90.0     62.25     16.47
J-9  |    9         -259.0     62.25     16.26
J-10 |   10         -343.0     62.25     16.07
J-11 |   11         -470.0     62.25     16.00
K    |   13
L-1  |    1    1    1     NYLON
L-2  |    2    2    1     NYLON
L-3  |    3    3    3     NYLON
L-4  |    4    4    2     NYLON
L-5  |    5    5    4     NYLON
L-6  |    6    5    5     NYLON
L-7  |    7    6    6     NYLON
L-8  |    8    7    7     NYLON
L-9  |    9    7    8     NYLON
L-10 |   10    8    9     NYLON
L-11 |   11    9   10     NYLON
L-12 |   12   10   11     NYLON
L-13 |   13   11   11     NYLON
M-1  |    1            7.0       0.0 159300.0      500.0       0.0       0.0
M-2  |    2            7.0       0.0 159300.0      500.0       0.0       0.0
M-3  |    3            8.0       0.0 159300.0      500.0       0.0       0.0
M-4  |    4            7.5       0.0 159300.0      500.0       0.0       0.0
M-5  |    5            4.5       0.0 159300.0      500.0       0.0       0.0
M-6  |    6            7.5       0.0 159300.0      500.0       0.0       0.0
```

LINE TYPE	COLUMN 1 2 3 4 5 6 7 8 12345678901234567890123456789012345678901234567890123456789012345678901234567890						
M-7	7	0.0	0.0	159300.0	500.0	0.0	0.0
M-8	8	7.0	0.0	159300.0	500.0	0.0	0.0
M-9	9	6.0	0.0	159300.0	500.0	0.0	0.0
M-10	10	0.0	0.0	159300.0	500.0	0.0	0.0
M-11	11	8.0	0.0	159300.0	500.0	0.0	0.0
M-12	12	0.0	0.0	159300.0	500.0	0.0	0.0
M-13	13	7.0	0.0	159300.0	500.0	0.0	0.0
N	10						
O-1	2	.09	120.0	46.0	87.0	1000.0	5000.0
O-2	3	.10	120.0	46.0	87.0	1000.0	5000.0
O-3	4	.11	120.0	46.0	87.0	1000.0	5000.0
O-4	5	.09	120.0	46.0	110.0	1000.0	5000.0
O-5	6	.10	120.0	46.0	110.0	1000.0	5000.0
O-6	7	.11	120.0	46.0	110.0	1000.0	5000.0
O-7	8	1.0	120.0	46.0	87.0	1000.0	5000.0
O-8	9	1.0	120.0	46.0	110.0	1000.0	5000.0
O-9	10	2.0	120.0	46.0	87.0	1000.0	5000.0

FIXED MOORING ANALYSIS OUTPUT

FIXED MOORING ANALYSIS INPUT DATA:
SHIP CLASS: LHA
SHIP DESIGNATION: LHA
HULL NUMBER: 1

LENGTH OVERALL:	820.0 FT
LENGTH AT THE WATERLINE:	765.0 FT
BEAM:	106.0 FT
DRAFT:	21.3 FT
SIDE PROJECTED AREA:	74950.0 SQ FT
END PROJECTED AREA:	11250.0 SQ FT
DISPLACEMENT:	30020.0 LONG TONS
SUPERSTRUCTURE AREA:	18206.0 SQ FT
SUPERSTRUCTURE HEIGHT:	94.0 FT
HULL AREA:	56744.0 SQ FT
HULL HEIGHT:	35.0 FT
SUPERSTRUCTURE LOCATION:	NOT APPLICABLE
HULL TYPE:	HULL DOMINATED VESSEL

WATER DEPTH: 37.4 FT.
TIDE HEIGHT: 0.0 FT.

FENDER INPUT DATA:
MAX. NUMBER: 7

FENDER	LOCATION		MINIMUM		MAXIMUM		FENDER
NO.	X (FT)	Y (FT)	LOAD (LBS)	DEFL (FT)	LOAD (LBS)	DEFL (FT)	TYPE
1	80.0	53.0	50000.0	0.01	425000.0	0.10	STPILE
2	10.0	53.0	50000.0	0.01	425000.0	0.10	STPILE
3	-60.0	53.0	50000.0	0.01	425000.0	0.10	STPILE
4	-130.0	53.0	50000.0	0.01	425000.0	0.10	STPILE
5	-200.0	53.0	50000.0	0.01	425000.0	0.10	STPILE
6	-270.0	53.0	50000.0	0.01	425000.0	0.10	STPILE
7	-340.0	53.0	50000.0	0.01	425000.0	0.10	STPILE

FENDER NO.	FENDER DESCRIPTION
ALL	STEEL PILE FENDER (16 WF 100) WITH A 36 INCH DIAMETER WOOD CAMEL

SHIP CHOCK LOCATIONS:

CHOCK	SHIP CHOCK COORDINATES (FT)		
NO.	XC	YC	ZC
1	410.0	-4.0	59.5
2	410.0	4.0	59.5
3	379.0	48.5	59.5
4	334.0	53.0	59.5
5	176.0	53.0	42.5
6	35.5	53.0	14.7
7	-48.0	53.0	42.5
8	-251.5	53.0	14.7

9	-391.0	53.0	58.2
10	-404.0	53.0	58.2
11	-410.0	31.0	58.2

PIER MOORING POINT LOCATIONS:
MAX. NUMBER OF PIER MOORING POINTS: 11

MOORING POINT	PIER MOORING POINT COORDINATES (FT) X1	Y1	Z1
1	540.0	62.2	17.2
2	412.0	62.2	17.1
3	330.0	62.2	17.0
4	245.0	62.2	16.9
5	138.0	62.2	16.7
6	77.0	62.2	16.7
7	-8.0	62.2	16.6
8	-90.0	62.2	16.5
9	-259.0	62.2	16.3
10	-343.0	62.2	16.1
11	-470.0	62.2	16.0

MOORING LINE INPUT DATA:
MAX. NUMBER: 13

MOORING LINE	CHOCK NO.	PIER MOORING POINT NO.	SAFETY FACTOR	LINE TYPE
1	1	1	11.0 %	NYLON
2	2	1	11.0 %	NYLON
3	3	3	11.0 %	NYLON
4	4	2	11.0 %	NYLON
5	5	4	11.0 %	NYLON
6	5	5	11.0 %	NYLON
7	6	6	11.0 %	NYLON
8	7	7	11.0 %	NYLON
9	7	8	11.0 %	NYLON
10	8	9	11.0 %	NYLON
11	9	10	11.0 %	NYLON
12	10	11	11.0 %	NYLON
13	11	11	11.0 %	NYLON

MOORING LINE NO.	MOORING LINE DESCRIPTION
ALL	NYLON LINE

LINE NO.	ON-DECK LENGTH (FT)	TAIL LENGTH (FT)	BREAKING STRENGTH (LBS)	PRELOAD (LBS)	ELASTIC MODULUS (PSI)	STEEL AREA (SQ-IN)
1	7.0	0.0	159300.	500.0	0.0	0.000
2	7.0	0.0	159300.	500.0	0.0	0.000
3	8.0	0.0	159300.	500.0	0.0	0.000
4	7.5	0.0	159300.	500.0	0.0	0.000
5	4.5	0.0	159300.	500.0	0.0	0.000
6	7.5	0.0	159300.	500.0	0.0	0.000
7	0.0	0.0	159300.	500.0	0.0	0.000

8	7.0	0.0	159300.	500.0	0.0	0.000
9	6.0	0.0	159300.	500.0	0.0	0.000
10	0.0	0.0	159300.	500.0	0.0	0.000
11	8.0	0.0	159300.	500.0	0.0	0.000
12	0.0	0.0	159300.	500.0	0.0	0.000
13	7.0	0.0	159300.	500.0	0.0	0.000

FORCES DUE TO ENVIRONMENTAL CONDITIONS:
ENVIRONMENTAL FORCES CALCULATED BY METHODS IN DM26.4
NUMBER OF LOAD CASES: 9

	ENVIRONMENTAL CONDITIONS				LOAD CONDITIONS				
LOAD	CURRENT		WIND		X	Y		TOLERANCE	
CASE	SPEED (KTS)	ANGLE (DEG)	SPEED (MPH)	ANGLE (DEG)	FORCE (LBS)	FORCE (LBS)	MOMENT (FT-LBS)	FORCE (LBS)	MOMENT (FT-LBS)
1	0.1	120.0	46.0	87.0	10152.	408314.	1895338.	1000.	5000.
2	0.1	120.0	46.0	87.0	10148.	408537.	1887161.	1000.	5000.
3	0.1	120.0	46.0	87.0	10145.	408783.	1878122.	1000.	5000.
4	0.1	120.0	46.0	110.0	3155.	407474.	-11642606.	1000.	5000.
5	0.1	120.0	46.0	110.0	3152.	407697.	-11650784.	1000.	5000.
6	0.1	120.0	46.0	110.0	3148.	407943.	-11659823.	1000.	5000.
7	1.0	120.0	46.0	87.0	8494.	524579.	-2373920.	1000.	5000.
8	1.0	120.0	46.0	110.0	1497.	523740.	-15911865.	1000.	5000.
9	2.0	120.0	46.0	87.0	3576.	876223.	-15286285.	1000.	5000.

FIXED MOORING ANALYSIS RESULTS
INITIAL POSITION-NO ENVIRONMENTAL LOADS

	ENVIRONMENTAL LOAD	EQUILIBRIUM ERROR	SHIP DISPLACEMENT
SURGE	0. LBS	0.00 LBS	0.04 FT
SWAY	0. LBS	0.00 LBS	0.00 FT
YAW	0. FT-LBS	0.00 FT-LBS	0.00 DEG

FENDER RESULTS

FENDER NO.	DEFLECTION SET OFF (FT)	FENDER HORIZ REACTION (LBS)	REACTION ANGLE (DEG)
1	0.00	705.	90.00
2	0.00	548.	90.00
3	0.00	390.	90.00
4	0.00	232.	90.00
5	0.00	74.	90.00
6	0.00	0.	90.00
7	0.00	0.	90.00

MOORING LINE RESULTS

LINE NO.	HORIZ REACTION (LBS)	TOTAL REACTION (LBS)	% B.S.	HORIZ LENGTH (FT)	LINE ANGLE (DEG)
1	460.	479.	0.3	145.9	27.0
2	458.	478.	0.3	142.4	24.1
3	450.	586.	0.4	50.9	164.3
4	415.	472.	0.3	78.5	6.8
5	423.	451.	0.3	69.6	7.6
6	498.	596.	0.4	39.2	166.3
7	393.	394.	0.2	42.5	12.6
8	380.	450.	0.3	41.0	13.0
9	506.	591.	0.4	43.0	167.6
10	737.	743.	0.5	11.9	129.2
11	370.	488.	0.3	48.8	10.9
12	482.	570.	0.4	66.7	172.0
13	477.	562.	0.4	67.7	152.5

FIXED MOORING ANALYSIS RESULTS
LOAD CASE 1

	ENVIRONMENTAL LOAD	EQUILIBRIUM ERROR	SHIP DISPLACEMENT
SURGE	10152. LBS	0.00 LBS	0.86 FT
SWAY	408314. LBS	0.00 LBS	0.03 FT
YAW	1895338. FT-LBS	0.00 FT-LBS	0.01 DEG

FENDER RESULTS

FENDER NO.	DEFLECTION SET OFF (FT)	FENDER HORIZ REACTION (LBS)	REACTION ANGLE (DEG)
1	0.04	158446.	90.01
2	0.03	120628.	90.01
3	0.02	82810.	90.01
4	0.01	44992.	90.01
5	0.00	7173.	90.01
6	-0.01	0.	90.01
7	-0.02	0.	90.01

MOORING LINE RESULTS

LINE NO.	HORIZ REACTION (LBS)	TOTAL REACTION (LBS)	% B.S.	HORIZ LENGTH (FT)	LINE ANGLE (DEG)
1	0.	0.	0.0	145.1	27.1
2	0.	0.	0.0	141.6	24.2
3	1142.	1479.	0.9	51.7	164.7
4	0.	0.	0.0	77.7	6.8
5	0.	0.	0.0	68.8	7.7
6	1613.	1920.	1.2	39.9	166.7
7	0.	0.	0.0	41.7	12.8
8	0.	0.	0.0	40.2	13.3
9	1643.	1911.	1.2	43.8	167.8
10	5403.	5445.	3.4	12.5	132.1
11	0.	0.	0.0	48.0	11.1
12	1292.	1524.	1.0	67.5	172.1
13	1155.	1356.	0.9	68.4	152.8

FIXED MOORING ANALYSIS RESULTS
LOAD CASE 2

	ENVIRONMENTAL LOAD	EQUILIBRIUM ERROR	SHIP DISPLACEMENT
SURGE	10148. LBS	0.00 LBS	0.86 FT
SWAY	408537. LBS	0.00 LBS	0.03 FT
YAW	1887161. FT-LBS	0.00 FT-LBS	0.01 DEG

FENDER RESULTS

FENDER NO.	DEFLECTION SET OFF (FT)	FENDER HORIZ REACTION (LBS)	REACTION ANGLE (DEG)
1	0.04	158506.	90.01
2	0.03	120680.	90.01
3	0.02	82854.	90.01
4	0.01	45028.	90.01
5	0.00	7202.	90.01
6	-0.01	0.	90.01
7	-0.02	0.	90.01

MOORING LINE RESULTS

LINE NO.	HORIZ REACTION (LBS)	TOTAL REACTION (LBS)	% B.S.	HORIZ LENGTH (FT)	LINE ANGLE (DEG)
1	0.	0.	0.0	145.1	27.1
2	0.	0.	0.0	141.6	24.2
3	1142.	1478.	0.9	51.7	164.7
4	0.	0.	0.0	77.7	6.8
5	0.	0.	0.0	68.8	7.7
6	1613.	1920.	1.2	39.9	166.7
7	0.	0.	0.0	41.7	12.8
8	0.	0.	0.0	40.2	13.3
9	1643.	1911.	1.2	43.8	167.8
10	5401.	5443.	3.4	12.5	132.1
11	0.	0.	0.0	48.0	11.1
12	1292.	1523.	1.0	67.5	172.1
13	1154.	1356.	0.9	68.4	152.8

FIXED MOORING ANALYSIS RESULTS
LOAD CASE 3

	ENVIRONMENTAL LOAD	EQUILIBRIUM ERROR	SHIP DISPLACEMENT
SURGE	10145. LBS	0.00 LBS	0.86 FT
SWAY	408783. LBS	0.00 LBS	0.03 FT
YAW	1878122. FT-LBS	0.00 FT-LBS	0.01 DEG

FENDER RESULTS

FENDER NO.	DEFLECTION SET OFF (FT)	FENDER HORIZ REACTION (LBS)	REACTION ANGLE (DEG)
1	0.04	158571.	90.01
2	0.03	120737.	90.01
3	0.02	82903.	90.01
4	0.01	45069.	90.01
5	0.00	7234.	90.01
6	-0.01	0.	90.01
7	-0.02	0.	90.01

MOORING LINE RESULTS

LINE NO.	HORIZ REACTION (LBS)	TOTAL REACTION (LBS)	% B.S.	HORIZ LENGTH (FT)	LINE ANGLE (DEG)
1	0.	0.	0.0	145.1	27.1
2	0.	0.	0.0	141.6	24.2
3	1141.	1478.	0.9	51.7	164.7
4	0.	0.	0.0	77.7	6.8
5	0.	0.	0.0	68.8	7.7
6	1612.	1919.	1.2	39.9	166.7
7	0.	0.	0.0	41.7	12.8
8	0.	0.	0.0	40.2	13.3
9	1642.	1910.	1.2	43.8	167.8
10	5399.	5441.	3.4	12.5	132.1
11	0.	0.	0.0	48.0	11.1
12	1291.	1523.	1.0	67.5	172.1
13	1154.	1356.	0.9	68.4	152.8

FIXED MOORING ANALYSIS RESULTS
LOAD CASE 4

	ENVIRONMENTAL LOAD	EQUILIBRIUM ERROR	SHIP DISPLACEMENT
SURGE	3155. LBS	0.00 LBS	0.24 FT
SWAY	407474. LBS	0.00 LBS	0.02 FT
YAW	-11642606. FT-LBS	0.00 FT-LBS	0.00 DEG

FENDER RESULTS

FENDER NO.	DEFLECTION SET OFF (FT)	FENDER HORIZ REACTION (LBS)	REACTION ANGLE (DEG)
1	0.03	124070.	90.00
2	0.02	101785.	90.00
3	0.02	79501.	90.00
4	0.01	57216.	90.00
5	0.01	34932.	90.00
6	0.00	12647.	90.00
7	0.00	0.	90.00

MOORING LINE RESULTS

LINE NO.	HORIZ REACTION (LBS)	TOTAL REACTION (LBS)	% B.S.	HORIZ LENGTH (FT)	LINE ANGLE (DEG)
1	332.	346.	0.2	145.7	27.0
2	328.	342.	0.2	142.2	24.2
3	610.	793.	0.5	51.1	164.5
4	238.	271.	0.2	78.3	6.7
5	181.	193.	0.1	69.4	7.6
6	760.	908.	0.6	39.3	166.5
7	0.	0.	0.0	42.3	12.6
8	99.	118.	0.1	40.8	13.1
9	777.	907.	0.6	43.2	167.7
10	1805.	1820.	1.1	12.1	129.9
11	195.	258.	0.2	48.6	11.0
12	678.	802.	0.5	66.9	172.0
13	642.	756.	0.5	67.9	152.6

FIXED MOORING ANALYSIS RESULTS
LOAD CASE 5

	ENVIRONMENTAL LOAD	EQUILIBRIUM ERROR	SHIP DISPLACEMENT
SURGE	3152. LBS	0.00 LBS	0.24 FT
SWAY	407697. LBS	0.00 LBS	0.02 FT
YAW	-11650784. FT-LBS	0.00 FT-LBS	0.00 DEG

FENDER RESULTS

FENDER NO.	DEFLECTION SET OFF (FT)	FENDER HORIZ REACTION (LBS)	REACTION ANGLE (DEG)
1	0.03	124133.	90.00
2	0.02	101838.	90.00
3	0.02	79543.	90.00
4	0.01	57248.	90.00
5	0.01	34953.	90.00
6	0.00	12658.	90.00
7	0.00	0.	90.00

MOORING LINE RESULTS

LINE NO.	HORIZ REACTION (LBS)	TOTAL REACTION (LBS)	% B.S.	HORIZ LENGTH (FT)	LINE ANGLE (DEG)
1	333.	346.	0.2	145.7	27.0
2	328.	342.	0.2	142.2	24.2
3	609.	793.	0.5	51.1	164.5
4	238.	271.	0.2	78.3	6.7
5	181.	193.	0.1	69.4	7.6
6	759.	908.	0.6	39.3	166.5
7	0.	0.	0.0	42.3	12.6
8	100.	118.	0.1	40.8	13.1
9	776.	906.	0.6	43.2	167.7
10	1804.	1819.	1.1	12.1	129.9
11	195.	258.	0.2	48.6	11.0
12	678.	802.	0.5	66.9	172.0
13	642.	756.	0.5	67.9	152.6

FIXED MOORING ANALYSIS RESULTS
LOAD CASE 6

	ENVIRONMENTAL LOAD	EQUILIBRIUM ERROR	SHIP DISPLACEMENT
SURGE	3148. LBS	0.00 LBS	0.24 FT
SWAY	407943. LBS	0.00 LBS	0.02 FT
YAW	-11659823. FT-LBS	0.00 FT-LBS	0.00 DEG

FENDER RESULTS

FENDER NO.	DEFLECTION SET OFF (FT)	FENDER HORIZ REACTION (LBS)	REACTION ANGLE (DEG)
1	0.03	124203.	90.00
2	0.02	101897.	90.00
3	0.02	79590.	90.00
4	0.01	57283.	90.00
5	0.01	34976.	90.00
6	0.00	12669.	90.00
7	0.00	0.	90.00

MOORING LINE RESULTS

LINE NO.	HORIZ REACTION (LBS)	TOTAL REACTION (LBS)	% B.S.	HORIZ LENGTH (FT)	LINE ANGLE (DEG)
1	333.	346.	0.2	145.7	27.0
2	328.	342.	0.2	142.2	24.2
3	609.	792.	0.5	51.1	164.5
4	239.	271.	0.2	78.3	6.7
5	182.	194.	0.1	69.4	7.6
6	759.	908.	0.6	39.3	166.5
7	0.	0.	0.0	42.3	12.6
8	100.	118.	0.1	40.8	13.1
9	776.	906.	0.6	43.2	167.7
10	1802.	1817.	1.1	12.1	129.9
11	195.	259.	0.2	48.6	11.0
12	678.	801.	0.5	66.9	172.0
13	642.	756.	0.5	67.9	152.6

FIXED MOORING ANALYSIS RESULTS
LOAD CASE 7

	ENVIRONMENTAL LOAD	EQUILIBRIUM ERROR	SHIP DISPLACEMENT
SURGE	8494. LBS	0.00 LBS	0.70 FT
SWAY	524579. LBS	0.00 LBS	0.03 FT
YAW	-2373920. FT-LBS	0.00 FT-LBS	0.01 DEG

FENDER RESULTS

FENDER NO.	DEFLECTION SET OFF (FT)	FENDER HORIZ REACTION (LBS)	REACTION ANGLE (DEG)
1	0.05	189520.	90.01
2	0.04	147707.	90.01
3	0.03	105894.	90.01
4	0.02	64081.	90.01
5	0.01	22268.	90.01
6	0.00	0.	90.01
7	-0.01	0.	90.01

MOORING LINE RESULTS

LINE NO.	HORIZ REACTION (LBS)	TOTAL REACTION (LBS)	% B.S.	HORIZ LENGTH (FT)	LINE ANGLE (DEG)
1	66.	69.	0.0	145.2	27.1
2	52.	54.	0.0	141.8	24.2
3	999.	1295.	0.8	51.5	164.6
4	0.	0.	0.0	77.8	6.8
5	0.	0.	0.0	68.9	7.7
6	1387.	1652.	1.0	39.8	166.6
7	0.	0.	0.0	41.8	12.7
8	0.	0.	0.0	40.4	13.2
9	1415.	1648.	1.0	43.7	167.8
10	4447.	4483.	2.8	12.4	131.5
11	0.	0.	0.0	48.2	11.1
12	1132.	1336.	0.8	67.3	172.1
13	1023.	1203.	0.8	68.3	152.7

FIXED MOORING ANALYSIS RESULTS
LOAD CASE 8

	ENVIRONMENTAL LOAD	EQUILIBRIUM ERROR	SHIP DISPLACEMENT
SURGE	1497. LBS	0.00 LBS	0.14 FT
SWAY	523740. LBS	0.00 LBS	0.03 FT
YAW	-15911865. FT-LBS	0.00 FT-LBS	0.01 DEG

FENDER RESULTS

FENDER NO.	DEFLECTION SET OFF (FT)	FENDER HORIZ REACTION (LBS)	REACTION ANGLE (DEG)
1	0.04	157184.	90.01
2	0.03	129376.	90.01
3	0.02	101567.	90.01
4	0.02	73759.	90.01
5	0.01	45950.	90.01
6	0.00	18141.	90.01
7	0.00	0.	90.01

MOORING LINE RESULTS

LINE NO.	HORIZ REACTION (LBS)	TOTAL REACTION (LBS)	% B.S.	HORIZ LENGTH (FT)	LINE ANGLE (DEG)
1	386.	402.	0.3	145.8	27.0
2	384.	401.	0.3	142.3	24.1
3	515.	670.	0.4	51.0	164.4
4	328.	373.	0.2	78.4	6.7
5	305.	325.	0.2	69.5	7.6
6	611.	731.	0.5	39.2	166.4
7	149.	150.	0.1	42.4	12.6
8	243.	288.	0.2	40.9	13.0
9	628.	733.	0.5	43.1	167.7
10	1208.	1218.	0.8	12.0	129.6
11	289.	381.	0.2	48.8	10.9
12	575.	680.	0.4	66.8	172.0
13	558.	657.	0.4	67.8	152.5

FIXED MOORING ANALYSIS RESULTS
LOAD CASE 9

	ENVIRONMENTAL LOAD	EQUILIBRIUM ERROR	SHIP DISPLACEMENT
SURGE	3576. LBS	0.00 LBS	0.29 FT
SWAY	876223. LBS	0.00 LBS	0.05 FT
YAW	-15286285. FT-LBS	0.00 FT-LBS	0.01 DEG

FENDER RESULTS

FENDER NO.	DEFLECTION SET OFF (FT)	FENDER HORIZ REACTION (LBS)	REACTION ANGLE (DEG)
1	0.07	285903.	90.01
2	0.06	230143.	90.01
3	0.04	174384.	90.01
4	0.03	118624.	90.01
5	0.02	62865.	90.01
6	0.00	7105.	90.01
7	-0.01	0.	90.01

MOORING LINE RESULTS

LINE NO.	HORIZ REACTION (LBS)	TOTAL REACTION (LBS)	% B.S.	HORIZ LENGTH (FT)	LINE ANGLE (DEG)
1	286.	298.	0.2	145.6	27.0
2	283.	295.	0.2	142.1	24.1
3	624.	812.	0.5	51.1	164.5
4	199.	226.	0.1	78.3	6.7
5	129.	137.	0.1	69.3	7.6
6	794.	950.	0.6	39.4	166.5
7	0.	0.	0.0	42.2	12.6
8	40.	47.	0.0	40.8	13.0
9	821.	958.	0.6	43.3	167.7
10	2007.	2023.	1.3	12.1	130.1
11	165.	218.	0.1	48.6	11.0
12	717.	848.	0.5	66.9	172.0
13	682.	803.	0.5	67.9	152.6

Appendix B

SHIP CHARACTERISTICS FILE

SHIP CHARACTERISTICS DATA FILE

To run the program for a specific ship class (SHIPCL) a ship characteristics file is required. The ship data file name is in the general form of SHIPCL.DAT where SHIPCL is the same ship class character code used in FIXMOOR.DAT and explained in data line Type A of FIXMOOR.DAT. Ship data files have been set up for carriers (CV.DAT), battleships (BB.DAT), destroyers (DD.DAT), cruisers (CG.DAT), frigates (FF.DAT), and Amphibious Assault Ships (LHA.DAT). Ship characteristic values are in the English System of Units using feet, square feet, and long tons. The CXYW coefficients (Data Line Type G) for both frigates and battleships are based on a midship superstructure location. Values for a superstructure aft and forward of midships are presented in DM26.4 Figure 21. When the user selects the option to input the environmental forces directly by using the FORCE.DAT file then data lines G, H, I and J can be left blank in the ship properties file, but seven (7) blank lines must be present. To set up a data file for a specific ship class the following parameters are defined:

Data Line Type A - Ship class.

Variable	Column	Description
SHC	1-12	SHIP class description. The user chooses a maximum of 12 characters. For example, SHC = CARRIER writes CARRIER in the output file.

Data Line Type B - Maximum number of hull types within the SHIP class.

Variable	Column	Description
NUMHULS	1-5	Maximum number of hull groupings with different SHIP characteristics. It must be right justified.
IA	6-10 11-15 16-20 . . 71-75 76-80	Maximum number of hull number data fields for each unique hull grouping. Each unique IA value is placed in a 5 column field the maximum number of IA values permitted is 32. A new line is required after 16 values have been entered.

Data Line Type C - Hull numbers for each unique hull grouping.

Variable	Column	Description
IHNO	1-5 6-10 11-15 16-20 . . . 71-75 76-80	Hull numbers placed in columns 1 to 80 are placed in five column fields and must be right justified. Should additional lines be needed to complete the list of hull numbers, place the next hull number on the next line and continue as before. For multihull number sequences use a two number combination, the second is a negative number, to span all the hull numbers. Values are right justified in te field. The first hull number in the sequence is followed by the negative of the last hull number in the next field (e.g., 24 -35 generates 24 through 35).

Data Line Type D - Ship characteristics.

The first line of ship characteristics must correspond to the data required for the first unique hull grouping defined on line type C. Each succeeding line of ship characteristics follows sequentially. Values are right justified. Refer to DM26.6 Table 2.

Variable	Column	Description
LOA	1-8	Ship's length overall in feet, a zero denotes the ship is under construction.
LWL	9-16	Ship's length at the water line in feet
BEAM	17-24	Ship's beam in feet
DRAFT	25-32	Ship's draft in feet
SDEPROJA	33-42	Ship's side projected area above the waterline in square feet (broadside wind)
ENDPROJA	43-52	Ship's end projected area above the waterline in square feet (frontal wind)
DISPLACE	53-62	Ship's displacement in long tons
HLTYPE	63-65	Ship's hull type code: 1 = hull dominated vessel 2 = normal vessel

Data Line Type E - Chock control line.

Variable	Column	Description
K1	1-5	Ship hull group number selected using DATA LINE type C.
NCR	6-10	Number of unique chocks on one side of the ship. The program will mirror these on the other side.

Data Line Type F - Chock coordinates.

Variable	Column	Description
CN		Chock number beginning with the bow.
XC		Chock X coordinate (ft)
YC		Chock Y coordinate (ft)
ZC		Chock Z coordinate (ft)

Data Line Type G - Super Structure and Hull Areas.

The first line of the superstructure and hull areas must correspond to the data required for the first unique hull grouping. Each succeeding line of superstructure and hull areas follows sequentially. Values are right justified.

Variable	Column	Description
SSTRAREA	1-10	Lateral projected area (ft^2) of the superstructure only.
SSTRHGT	11-20	Average height (ft) of the superstructure. To obtain this value add the total hull height to the average of the height of the superstructure above the main deck of the ship.
HULLAREA	21-31	Lateral projected area (ft^2) of the hull only.
HULLHGT	41-50	Average height (ft) of the hull.

Note: A user check on the lateral projected areas is the following:

SDEPROJA = SSTRAREA + HULLAREA

Data Line Type H - Super structure location.

Variable	Column	Description
CSSTR	1-80	Super structure location: NOT APPLICABLE MIDSHIPS Forward of MIDSHIPS Aft of MIDSHIPS

Data Line Type I - Ship wind YAW moment coefficients.

Variable	Column	Description
CXYW	1-8 9-16 17-24 . . . . 65-72 73-80	YAW moment coefficients DM26.4 Figures 20 through 23 due to wind are placed in eight column fields and are right justified. A total of nineteen (19) values must be specified in ten degree (10°) increments of the wind angle. The beginning value must be for zero degrees (0°). An additional line will be needed to complete the list of nineteen values. Begin the second line in columns 1-8 and continue as before.

Data Line Type J - Ship lateral current load moment coefficient.

Variable	Column	Description
ELL	1-8 9-16 17-24 . . . . 65-72 73-80	Lateral current load moment coefficients E_c/L_{wl} ratios from DM26.4 Figure 27 are placed in eight (8) column fields and are right justified. A total of nineteen (19) values must be specified in ten degree (10°) increments of the current angle. The beginning value must be for zero degrees (0°). The zero degree value being at the ship's bow. An additional line will be needed to complete the list of nineteen values. Begin the second line in columns 1-8 and continue as before.

Data Line Type K - Ship hull type K - coefficient.

Variable	Column	Description
KHLTYPE	1-8 9-16 17-24 . . . . . 65-72 73-80	Ship hull type coefficients are positioned in eight (8) column blocks and are right justified. A total of twelve (12) values must be specified in 0.05 increments of the block coefficient. The beginning value must be for a block coefficient of 0.462. The values specified in the ship files come from DM26.4 Figure 26. An additional line will be needed to complete the list of twelve values. Begin the second line in columns 1-8 and continue as before.

Data Line Type L - Ship coefficients for drag calculations.

Variable	Column	Description
AR	1-8	Ship area ratio for propeller drag calculations. (DM26.4 Table 8)
THWZ	9-16	Incident wind angle that produces no net longitudinal force. It is based on the super-structure location. Refer to DM26.4 Table 5.
CP	17-24	Ship primatic coefficient. C_p = 0.567 for hull dominate ships. C_p = 0.539 for normal vessels. Also refer to DM26.4 equation 4-38 and Table. 7

Ship Properties Files

LINE TYPE	COLUMN									
	1 2 3 4 5 6 7 8									
	12345678901234567890123456789012345678901234567890123456789012345678901234567890									
	CV.DAT									
A	CARRIER									
B	9	1	2	2	3	1	1	1	2	4
C-1	34									
C-2	41	43								
C-3	59	-62								
C-4	63	64	66							
C-5	67									
C-6	31									
C-7	65									
C-8	68	-71								
C-9	11	12	20	38						
D-1	911.0	831.0	107.0	27.3	63200.0	8800.0	36720.0	1		
D-2	1001.0	914.0	121.0	29.9	69150.0	9350.0	53850.0	1		
D-3	1040.0	990.0	130.0	35.7	79100.0	14200.0	66400.0	1		
D-4	1073.0	990.0	130.0	31.4	85050.0	14650.0	66320.0	1		
D-5	1073.0	990.0	130.0	31.7	80500.0	16350.0	66430.0	1		
D-6	872.0	820.0	103.0	26.4	63200.0	8800.0	35000.0	1		
D-7	1088.0	1040.0	133.0	34.1	83050.0	17450.0	79320.0	1		
D-8	1115.0	1056.0	134.0	33.5	84150.0	15350.0	77780.0	1		
D-9	899.0	820.0	103.0	26.3	63500.0	12450.0	33700.0	1		
E-1	1	7								
F-1	1	222.5	0.0	35.1						
F-2	2	217.5	0.0	35.1						
F-3	3	162.5	15.5	30.1						
F-4	4	87.5	22.5	28.1						
F-5	5	-87.5	22.5	20.1						
F-6	6	-162.5	22.5	20.1						
F-7	7	-217.5	0.0	20.1						
E-2	2	6								
F-1	1	222.5	0.0	35.2						
F-2	2	217.5	0.0	35.2						
F-3	3	162.5	15.5	30.2						
F-4	4	87.5	22.5	28.2						
F-5	5	-87.5	22.5	20.2						
F-6	6	-162.5	22.5	20.2						
E-3	3	7								
F-1	1	222.5	0.0	35.3						
F-2	2	217.5	0.0	35.3						
F-3	3	162.5	15.5	30.3						
F-4	4	87.5	22.5	28.3						
F-5	5	-87.5	22.5	20.3						
F-6	6	-162.5	22.5	20.3						
F-7	7	-217.5	0.0	20.3						
E-4	4	8								

F-1	1	222.5	0.0	35.4	
F-2	2	217.5	0.0	35.4	
F-3	3	162.5	15.5	30.4	
F-4	4	87.5	22.5	28.4	
F-5	5	-87.5	22.5	20.4	
F-6	6	-162.5	22.5	20.4	
F-7	7	-217.5	0.0	20.4	
F-8	8	-222.5	0.0	20.4	
E-5	5	8			
F-1	1	222.5	0.0	35.5	
F-2	2	217.5	0.0	35.5	
F-3	3	162.5	15.5	30.5	
F-4	4	87.5	22.5	28.5	
F-5	5	-87.5	22.5	20.5	
F-6	6	-162.5	22.5	20.5	
F-7	7	-217.5	0.0	20.5	
F-8	8	-222.5	0.0	20.5	
E-6	6	5			
F-1	1	222.5	0.0	35.6	
F-2	2	217.5	0.0	35.6	
F-3	3	162.5	15.5	30.6	
F-4	4	87.5	22.5	28.6	
F-5	5	-87.5	22.5	20.6	
E-7	7	7			
F-1	1	222.5	0.0	35.7	
F-2	2	217.5	0.0	35.7	
F-3	3	162.5	15.5	30.7	
F-4	4	87.5	22.5	28.7	
F-5	5	-87.5	22.5	20.7	
F-6	6	-162.5	22.5	20.7	
F-7	7	-217.5	0.0	20.7	
E-8	8	8			
F-1	1	222.5	0.0	35.8	
F-2	2	217.5	0.0	35.8	
F-3	3	162.5	15.5	30.8	
F-4	4	87.5	22.5	28.8	
F-5	5	-87.5	22.5	20.8	
F-6	6	-162.5	22.5	20.8	
F-7	7	-217.5	0.0	20.8	
F-8	8	-222.5	0.0	20.8	
E-9	9	5			
F-1	1	222.5	0.0	35.9	
F-2	2	217.5	0.0	35.9	
F-3	3	162.5	15.5	30.9	
F-4	4	87.5	22.5	28.9	
F-5	5	-87.5	22.5	20.9	
G-1	8000.1	45.1	7730.1		15.1
G-2	8000.2	45.2	7730.2		15.2
G-3	8000.3	45.3	7730.3		15.3
G-4	8000.4	45.4	7730.4		15.4
G-5	8000.5	45.5	7730.5		15.5
G-6	8000.6	45.6	7730.6		15.6

G-7	8000.7	45.7	7730.7	15.7						
G-8	8000.8	45.8	7730.8	15.8						
G-9	8000.9	45.9	7730.9	15.9						
H	NOT APPLICABLE									
I-1A	.0000	.0269	.0488	.0625	.0700	.0631	.0500	.0325	.0194	.0000
I-1B	-.0138	-.0350	-.0588	-.0700	-.0663	-.0575	-.0413	-.0213	-.0000	
J-1B	.000	.138	.158	.135	.118	.100	.078	.055	.035	.015
J-1B	-.008	-.028	-.048	-.068	-.088	-.108	-.120	-.070	.000	
K-1A	0.733	0.760	0.825	0.925	1.063	1.250	1.488	1.763	2.138	2.588
K-1B	3.088	3.750								
L	125	120.	0.567							

LINE TYPE	COLUMN 1 2 3 4 5 6 7 8 12345678901234567890123456789012345678901234567890123456789012345678901234567890									
	BB.DAT									
A	BATTLESHIP									
B	1	2								
C-1	61	- 64								
D-1	888.0	860.0	108.0	31.7	41250.0	7450.0	48590.0	2		
E-1	1	7								
F-1	1	222.5	0.0	35.1						
F-2	2	217.5	0.0	35.1						
F-3	3	162.5	15.5	30.1						
F-4	4	87.5	22.5	28.1						
F-5	5	-87.5	22.5	20.1						
F-6	6	-162.5	22.5	20.1						
F-7	7	-217.5	0.0	20.1						
G-1	8000.1	45.1	7730.1	15.1						
H	MIDSHIPS									
I-1A	.000	.026	.059	.089	.106	.108	.100	.084	.049	.000
I-1B	-.025	-.061	-.084	-.101	-.103	-.090	-.070	-.040	.000	
J-1A	.000	.148	.168	.148	.128	.110	.090	.070	.050	.033
J-1B	.013	-.008	-.028	-.045	-.065	-.085	-.100	-.058	.000	
K-1A	0.733	0.738	0.763	0.813	0.895	1.000	1.150	1.343	1.600	1.950
K-1B	2.388	2.925								
L	130	90.	0.539							

LINE TYPE	COLUMN 1 2 3 4 5 6 7 8 12345678901234567890123456789012345678901234567890123456789012345678901234567890
	DD.DAT
A	DESTROYER
B	9 18 7 6 3 2 2 2 1 2
C-1A	743 763 784 785 817 821 822 825 827 842 862 -864 866 871 876 880
C-1B	883 886
C-2	931 942 944 -946 948 950 951
C-3	933 937 938 940 941 943
C-4	963 -992 997
C-5	2 -24
C-6	31 -34
C-7	37 -46
C-8	47
C-9	993 -996
D-1	391.0 383.0 40.0 12.7 9650.0 1350.0 2740.0 2
D-2	418.0 407.0 44.0 13.7 12750.0 1950.0 3270.0 2
D-3	418.0 407.0 44.0 13.7 13950.0 2200.0 3250.0 2
D-4	564.0 529.0 55.0 18.8 25250.0 4350.0 6450.0 2
D-5	437.0 420.0 46.0 13.4 15900.0 3000.0 3700.0 2
D-6	418.0 407.0 44.0 13.7 15400.0 2220.0 3310.0 2
D-7	513.0 490.0 52.0 16.5 21200.0 2750.0 4800.0 2
D-8	568.0 530.0 55.0 17.3 28100.0 5650.0 7350.0 2
D-9	0
E-1	1 7
F-1	1 222.5 0.0 35.1
F-2	2 217.5 0.0 35.1
F-3	3 162.5 15.5 30.1
F-4	4 87.5 22.5 28.1
F-5	5 -87.5 22.5 20.1
F-6	6 -162.5 22.5 20.1
F-7	7 -217.5 0.0 20.1
E-2	2 6
F-1	1 222.5 0.0 35.2
F-2	2 217.5 0.0 35.2
F-3	3 162.5 15.5 30.2
F-4	4 87.5 22.5 28.2
F-5	5 -87.5 22.5 20.2
F-6	6 -162.5 22.5 20.2
E-3	3 7
F-1	1 222.5 0.0 35.3
F-2	2 217.5 0.0 35.3
F-3	3 162.5 15.5 30.3
F-4	4 87.5 22.5 28.3
F-5	5 -87.5 22.5 20.3
F-6	6 -162.5 22.5 20.3
F-7	7 -217.5 0.0 20.3
E-4	4 8

F-1	1	222.5	0.0	35.4						
F-2	2	217.5	0.0	35.4						
F-3	3	162.5	15.5	30.4						
F-4	4	87.5	22.5	28.4						
F-5	5	-87.5	22.5	20.4						
F-6	6	-162.5	22.5	20.4						
F-7	7	-217.5	0.0	20.4						
F-8	8	-222.5	0.0	20.4						
E-5	5	8								
F-1	1	222.5	0.0	35.5						
F-2	2	217.5	0.0	35.5						
F-3	3	162.5	15.5	30.5						
F-4	4	87.5	22.5	28.5						
F-5	5	-87.5	22.5	20.5						
F-6	6	-162.5	22.5	20.5						
F-7	7	-217.5	0.0	20.5						
F-8	8	-222.5	0.0	20.5						
E-6	6	5								
F-1	1	222.5	0.0	35.6						
F-2	2	217.5	0.0	35.6						
F-3	3	162.5	15.5	30.6						
F-4	4	87.5	22.5	28.6						
F-5	5	-87.5	22.5	20.6						
E-7	7	7								
F-1	1	222.5	0.0	35.7						
F-2	2	217.5	0.0	35.7						
F-3	3	162.5	15.5	30.7						
F-4	4	87.5	22.5	28.7						
F-5	5	-87.5	22.5	20.7						
F-6	6	-162.5	22.5	20.7						
F-7	7	-217.5	0.0	20.7						
E-8	8	8								
F-1	1	222.5	0.0	35.8						
F-2	2	217.5	0.0	35.8						
F-3	3	162.5	15.5	30.8						
F-4	4	87.5	22.5	28.8						
F-5	5	-87.5	22.5	20.8						
F-6	6	-162.5	22.5	20.8						
F-7	7	-217.5	0.0	20.8						
F-8	8	-222.5	0.0	20.8						
E-9	9	0								
G-1	8000.1	45.1	7730.1	15.1						
G-2	8000.2	45.2	7730.2	15.2						
G-3	8000.3	45.3	7730.3	15.3						
G-4	8000.4	45.4	7730.4	15.4						
G-5	8000.5	45.5	7730.5	15.5						
G-6	8000.6	45.6	7730.6	15.6						
G-7	8000.7	45.7	7730.7	15.7						
G-8	8000.8	45.8	7730.8	15.8						
G-9	0.0	0.0	0.0	0.0						
H	NOT APPLICABLE									
I-1A	.0000	.0356	.0594	.0963	.1175	.1225	.1000	.0900	.0713	.0450

I-1B	.0213	.0050	-.0106	-.0125	-.0131	-.0150	-.0163	-.0150	.0000	
J-1A	.000	.148	.168	.148	.128	.110	.090	.070	.050	.033
J-1B	.013	-.008	-.028	-.045	-.065	-.085	-.100	-.058	.000	
K-1A	0.733	0.738	0.763	0.813	0.895	1.000	1.150	1.343	1.600	1.950
K-1B	2.388	2.925								
L	100	110.	0.539							

LINE TYPE	COLUMN 1 2 3 4 5 6 7 8 12345678901234567890123456789012345678901234567890123456789012345678901234567890
	CG.DAT
A	CRUISER
B	10 2 2 2 2 1 1 1 2 2 2
C-1	134 139
C-2	10 11
C-3	16 -24
C-4	26 -34
C-5	9
C-6	25
C-7	35
C-8	36 37
C-9	38 -41
C-10	47 48
D-1	717.0 700.0 75.0 22.8 31100.0 3900.0 17820.0 2
D-2	675.0 664.0 69.0 21.7 41650.0 6800.0 15300.0 2
D-3	533.0 510.0 54.0 14.9 22500.0 3650.0 6020.0 2
D-4	547.0 524.0 54.0 17.2 21600.0 3650.0 6310.0 2
D-5	720.0 690.0 72.0 23.7 36900.0 7250.0 16200.0 2
D-6	565.0 540.0 57.0 20.2 21350.0 3280.0 8060.0 2
D-7	564.0 540.0 57.0 19.6 22900.0 3340.0 8590.0 2
D-8	596.0 570.0 60.0 19.4 27000.0 3800.0 9290.0 2
D-9	586.0 560.0 61.0 20.2 24800.0 4430.0 9220.0 2
D-10	0
E-1	1 7
F-1	1 222.5 0.0 35.1
F-2	2 217.5 0.0 35.1
F-3	3 162.5 15.5 30.1
F-4	4 87.5 22.5 28.1
F-5	5 -87.5 22.5 20.1
F-6	6 -162.5 22.5 20.1
F-7	7 -217.5 0.0 20.1
E-2	2 6
F-1	1 222.5 0.0 35.2
F-2	2 217.5 0.0 35.2
F-3	3 162.5 15.5 30.2
F-4	4 87.5 22.5 28.2
F-5	5 -87.5 22.5 20.2
F-6	6 -162.5 22.5 20.2
E-3	3 7
F-1	1 222.5 0.0 35.3
F-2	2 217.5 0.0 35.3
F-3	3 162.5 15.5 30.3
F-4	4 87.5 22.5 28.3
F-5	5 -87.5 22.5 20.3
F-6	6 -162.5 22.5 20.3
F-7	7 -217.5 0.0 20.3

E-4	4	8		
F-1	1	222.5	0.0	35.4
F-2	2	217.5	0.0	35.4
F-3	3	162.5	15.5	30.4
F-4	4	87.5	22.5	28.4
F-5	5	-87.5	22.5	20.4
F-6	6	-162.5	22.5	20.4
F-7	7	-217.5	0.0	20.4
F-8	8	-222.5	0.0	20.4
E-5	5	8		
F-1	1	222.5	0.0	35.5
F-2	2	217.5	0.0	35.5
F-3	3	162.5	15.5	30.5
F-4	4	87.5	22.5	28.5
F-5	5	-87.5	22.5	20.5
F-6	6	-162.5	22.5	20.5
F-7	7	-217.5	0.0	20.5
F-8	8	-222.5	0.0	20.5
E-6	6	5		
F-1	1	222.5	0.0	35.6
F-2	2	217.5	0.0	35.6
F-3	3	162.5	15.5	30.6
F-4	4	87.5	22.5	28.6
F-5	5	-87.5	22.5	20.6
E-7	7	7		
F-1	1	222.5	0.0	35.7
F-2	2	217.5	0.0	35.7
F-3	3	162.5	15.5	30.7
F-4	4	87.5	22.5	28.7
F-5	5	-87.5	22.5	20.7
F-6	6	-162.5	22.5	20.7
F-7	7	-217.5	0.0	20.7
E-8	8	8		
F-1	1	222.5	0.0	35.8
F-2	2	217.5	0.0	35.8
F-3	3	162.5	15.5	30.8
F-4	4	87.5	22.5	28.8
F-5	5	-87.5	22.5	20.8
F-6	6	-162.5	22.5	20.8
F-7	7	-217.5	0.0	20.8
F-8	8	-222.5	0.0	20.8
E-9	9	5		
F-1	1	222.5	0.0	35.9
F-2	2	217.5	0.0	35.9
F-3	3	162.5	15.5	30.9
F-4	4	87.5	22.5	28.9
F-5	5	-87.5	22.5	20.9
E-10	10	0		
G-1	8000.1	45.1	7730.1	15.1
G-2	8000.2	45.2	7730.2	15.2
G-3	8000.3	45.3	7730.3	15.3
G-4	8000.4	45.4	7730.4	15.4

G-5	8000.5	45.5	7730.5	15.5						
G-6	8000.6	45.6	7730.6	15.6						
G-7	8000.7	45.7	7730.7	15.7						
G-8	8000.8	45.8	7730.8	15.8						
G-9	8000.9	45.9	7730.9	15.9						
G-10	0.0	0.0	0.0	0.0						
H	NOT APPLICABLE									
I-1A	.0000	.0163	.0269	.0425	.0525	.0563	.0463	.0350	.0231	.0000
I-1B	-.0206	-.0425	-.0563	-.0625	-.0500	-.0425	-.0288	-.0188	.0000	
J-1A	.000	.148	.168	.148	.128	.110	.090	.070	.050	.033
J-1B	.013	-.008	-.028	-.045	-.065	-.085	-.100	-.058	.000	
K-1A	0.733	0.738	0.763	0.813	0.895	1.000	1.150	1.343	1.600	1.950
K-1B	2.388	2.925								
L	160	110.	0.539							

```
                                        COLUMN
LINE           1         2         3         4         5         6         7         8
TYPE  12345678901234567890123456789012345678901234567890123456789012345678901234567890

      FF.DAT

A     FRIGATE
B         6    2    6    2    1    2    2
C-1    1037 1038
C-2    1040 1041 1043-1045 1047-1051
C-3    1052-1097
C-4    1098
C-5       1   -6
C-6       7  -49
D-1      372.0   350.0    41.0    13.3   10450.0    1870.0    2220.0  2
D-2      415.0   390.0    44.0    15.1   12700.0    2200.0    2940.0  2
D-3      438.0   415.0    47.0    14.0   15700.0    2900.0    3340.0  2
D-4      416.0   394.0    43.0    15.3   12150.0    1980.0    3060.0  2
D-5      415.0   390.0    44.0    15.1   13200.0    2200.0    2950.0  2
D-6      445.0   408.0    38.0    13.3   15730.0    2230.0    3180.0  2
E-1       1    7
F-1       1     222.5       0.0      35.1
F-2       2     217.5       0.0      35.1
F-3       3     162.5      15.5      30.1
F-4       4      87.5      22.5      28.1
F-5       5     -87.5      22.5      20.1
F-6       6    -162.5      22.5      20.1
F-7       7    -217.5       0.0      20.1
E-2       2    6
F-1       1     222.5       0.0      35.2
F-2       2     217.5       0.0      35.2
F-3       3     162.5      15.5      30.2
F-4       4      87.5      22.5      28.2
F-5       5     -87.5      22.5      20.2
F-6       6    -162.5      22.5      20.2
E-3       3    5
F-1       1     222.5       0.0      35.3
F-2       2     217.5       0.0      35.3

F-3       3     162.5      15.5      30.3
F-4       4      87.5      22.5      28.3
F-5       5     -87.5      22.5      20.3
E-4       4    7
F-1       1     222.5       0.0      35.4
F-2       2     217.5       0.0      35.4
F-3       3     162.5      15.5      30.4
F-4       4      87.5      22.5      28.4
F-5       5     -87.5      22.5      20.4
F-6       6    -162.5      22.5      20.4
F-7       7    -217.5       0.0      20.4
E-5       5    8
F-1       1     222.5       0.0      35.5
```

F-2	2	217.5	0.0	35.5						
F-3	3	162.5	15.5	30.5						
F-4	4	87.5	22.5	28.5						
F-5	5	-87.5	22.5	20.5						
F-6	6	-162.5	22.5	20.5						
F-7	7	-217.5	0.0	20.5						
F-8	8	-222.5	0.0	20.5						
E-6	6	8								
F-1	1	222.5	0.0	20.0						
F-2	2	217.5	0.0	20.0						
F-3	3	162.5	15.5	20.0						
F-4	4	87.5	22.5	20.0						
F-5	5	-87.5	22.5	20.0						
F-6	6	-162.5	22.5	20.0						
F-7	7	-217.5	0.0	20.0						
F-8	8	-222.5	0.0	20.0						
G-1	8000.1	45.1	7730.1	15.1						
G-2	8000.2	45.2	7730.2	15.2						
G-3	8000.3	45.3	7730.3	15.3						
G-4	8000.4	45.4	7730.4	15.4						
G-5	8000.5	45.5	7730.5	15.5						
G-6	8000.0	45.0	7730.0	15.0						
H	MIDSHIPS									
I-1A	.000	.026	.059	.089	.106	.108	.100	.084	.049	.000
I-1B	-.025	-.061	-.084	-.101	-.103	-.090	-.070	-.040	.000	
J-1A	.000	.148	.168	.148	.128	.110	.090	.070	.050	.033
J-1B	.013	-.008	-.028	-.045	-.065	-.085	-.100	-.058	.000	
K-1A	0.733	0.738	0.763	0.813	0.895	1.000	1.150	1.343	1.600	1.950
K-1B	2.388	2.925								
L	130	90.	0.539							

LINE TYPE	COLUMN 1234567890123456789012345678901234567890123456789012345678901234567890123456789 0									
	LHA.DAT									
A	LHA									
B	1	2								
C-1	1	-5								
D-1	820.0	765.0	106.0	21.3	74950.0	11250.0	30020.0	1		
E-1	1	11								
F-1	1	410.0	-4.0	59.5						
F-2	2	410.0	4.0	59.5						
F-3	3	379.0	48.5	59.5						
F-4	4	334.0	53.0	59.5						
F-5	5	176.0	53.0	42.5						
F-6	6	35.5	53.0	14.7						
F-7	7	-48.0	53.0	42.5						
F-8	8	-251.5	53.0	14.7						
F-9	9	-391.0	53.0	58.2						
F-10	10	-404.0	53.0	58.2						
F-11	11	-410.0	31.0	58.2						
G-1	18206.0	94.0	56744.0	35.0						
H	NOT APPLICABLE									
I-1A	.0000	.0269	.0488	.0625	.0700	.0631	.0500	.0325	.0194	.0000
I-1B	-.0138	-.0350	-.0588	-.0700	-.0663	-.0575	-.0413	-.0213	-.0000	
J-1A	.000	.138	.158	.135	.118	.100	.078	.055	.035	.015
J-1B	-.008	-.028	-.048	-.068	-.088	-.108	-.120	-.070	.000	
K-1A	0.733	0.760	0.825	0.925	1.063	1.250	1.488	1.763	2.138	2.588
K-1B	3.088	3.750								
L	125	120.	0.567							

Appendix C

FENDER LOAD-DEFLECTION FILE

Fender Load - Deflection Data Files

To run the program for a specific fender type (FENTYP) a fender data file is required. The fender data file name is in the general form of FENTYP.DAT where FENTYP is the same fender data file character name used in FIXMOOR.DAT and explained in data line Type H of FIXMOOR.DAT. Fender data files have been set up for the following fenders:

- RUBMIL.DAT — Rubber Millers, 6x12.5 foam filled fender at 60% compression
- SEWARD.DAT — Seaward International, 6x14 foam filled fender at 60% compression
- EXTRUB1.DAT — Extruded rubber fender, 7x10x3
- EXTRUB2.DAT — Extruded rubber fender, 10x10x14
- EXTRUB3.DAT — Extruded rubber fender, 12x12x5
- EXTRUB4.DAT — Extruded rubber fender, 14x14x6
- EXTRUB5.DAT — Extruded rubber fender, 20x20x8
- STPILE.DAT — Steel pile (16wf100), with a 36 inch diameter wood camel

Values given are loads in pounds and deflections in feet. Note that the foam fender dimensions are centerline length x diameter in feet and the extruded rubber fender is in pounds per foot length of fender and the dimensions are A x B x C in inches. To set up a data file for a specific fender type the following parameters are defined:

Data Line Type A - Fender name and description.

Variable	Column	Description
FTP	1-80	Fender name and description that the user chooses. A maximum of eighty (80) characters is available.

Data Line Type B - Maximum number of load - deflection data points.

Variable	Column	Description
ID	1-5	Maximum number of data points (right justified) the user chooses to enter to describe the fender's load - deflection curve. The more values used the better the curve is described. Maximum number is 51.

Data Line Type C - Load deflection data points.

Variable	Column	Description
SF	1-10	Load applied to the fender (lb). The first load date point must be 0.0.
RF	11-20	Deflection (ft) of the fender due to the applied load. The first deflection data point must be 0.0

Fender Load-Deflection Files

LINE TYPE	COLUMN 1 2 3 4 5 6 7 8 12345678901234567890123456789012345678901234567890123456789012345678901234567890	
	RUBMIL.DAT FENDER FILE	
A	RUBBER MILLERS, INC. 6x12.5 FOAM FILLED FENDER @ 60% COMPRESSION	
B	13	
C-1	0.0	0.0
C-2	20000.0	0.30
C-3	40000.0	0.60
C-4	50000.0	0.90
C-5	70000.0	1.20
C-6	80000.0	1.50
C-7	100000.0	1.80
C-8	110000.0	2.10
C-9	140000.0	2.40
C-10	180000.0	2.70
C-11	220000.0	3.00
C-12	250000.0	3.30
C-13	293000.0	3.60
	SEAWARD.DAT FENDER FILE	
A	SEAWARD INTERNATIONAL, 6x14 FOAM FILLED, @ 60% COMPRESSION	
B	39	
C-1	0.0	0.0
C-2	21150.0	0.27
C-3	27360.0	0.36
C-4	33190.0	0.45
C-5	38670.0	0.54
C-6	43840.0	0.63
C-7	48710.0	0.72
C-8	53330.0	0.81
C-9	57720.0	0.90
C-10	61900.0	0.99
C-11	65920.0	1.08
C-12	69790.0	1.17
C-13	73540.0	1.26
C-14	77210.0	1.35
C-15	80820.0	1.44
C-16	84410.0	1.53
C-17	88000.0	1.62
C-18	91610.0	1.71
C-19	95290.0	1.80
C-20	99060.0	1.89
C-21	102940.0	1.98
C-22	106970.0	2.07
C-23	111170.0	2.16
C-24	115580.0	2.25

Fender Load-Deflection Files (continued)

LINE TYPE	COLUMN 1234567890123456789012345678901234567890123456789012345678901234567890123456789 0	
C-25	120220.0	2.34
C-26	125130.0	2.43
C-27	130330.0	2.52
C-28	135840.0	2.61
C-29	141710.0	2.70
C-30	147950.0	2.79
C-31	154600.0	2.88
C-32	161690.0	2.97
C-33	169240.0	3.06
C-34	177290.0	3.15
C-35	185860.0	3.24
C-36	194990.0	3.33
C-37	204690.0	3.42
C-38	215000.0	3.51
C-39	225960.0	3.60
	EXTRUB1.DAT FENDER FILE	
A	EXTRUDED RUBBER FENDER, 7x10x3	
B	9	
C-1	0.0	0.0
C-2	5000.0	0.04
C-3	14000.0	0.08
C-4	22000.0	0.13
C-5	28000.0	0.17
C-6	45000.0	0.21
C-7	60000.0	0.25
C-8	90000.0	0.29
C-9	140000.0	0.33
	EXTRUB2.DAT FENDER FILE	
A	EXTRUDED RUBBER FENDER, 10x10x14	
B	12	
C-1	0.0	0.0
C-2	2000.0	0.04
C-3	5000.0	0.08
C-4	10000.0	0.13
C-5	15000.0	0.17
C-6	22000.0	0.21
C-7	28000.0	0.25
C-8	38000.0	0.29
C-9	53000.0	0.33
C-10	78000.0	0.38
C-11	107000.0	0.42
C-12	150000.0	0.45

Fender Load-Deflection Files (continued)

LINE TYPE	COLUMN 1 2 3 4 5 6 7 8 12345678901234567890123456789012345678901234567890123456789012345678901234567890	
	EXTRUB3.DAT FENDER FILE	
A	EXTRUDED RUBBER FENDER, 12x12x5	
B	15	
C-1	0.0	0.0
C-2	2000.0	0.04
C-3	5000.0	0.08
C-4	10000.0	0.13
C-5	15000.0	0.17
C-6	18000.0	0.21
C-7	21000.0	0.25
C-8	25000.0	0.29
C-9	29000.0	0.33
C-10	35000.0	0.38
C-11	46000.0	0.42
C-12	64000.0	0.46
C-13	85000.0	0.50
C-14	120000.0	0.54
C-15	150000.0	0.56
	EXTRUB4.DAT FENDER FILE	
A	EXTRUDED RUBBER FENDER, 14x14x6	
B	17	
C-1	0.0	0.0
C-2	2000.0	0.04
C-3	5000.0	0.08
C-4	10000.0	0.13
C-5	15000.0	0.17
C-6	18000.0	0.21
C-7	21000.0	0.25
C-8	25000.0	0.29
C-9	29000.0	0.33
C-10	35000.0	0.38
C-11	43000.0	0.42
C-12	55000.0	0.46
C-13	70000.0	0.50
C-14	86000.0	0.54
C-15	105000.0	0.58
C-16	134000.0	0.63
C-17	150000.0	0.64

Fender Load-Deflection Files (continued)

LINE TYPE	COLUMN 1234567890123456789012345678901234567890123456789012345678901234567890123456789 0	
	EXTRUB5.DAT FENDER FILE	
A	EXTRUDED RUBBER FENDER, 20x20x8	
B	19	
C-1	0.0	0.0
C-2	2000.0	0.04
C-3	5000.0	0.08
C-4	10000.0	0.13
C-5	15000.0	0.17
C-6	18000.0	0.21
C-7	2100.0	0.25
C-8	25000.0	0.29
C-9	29000.0	0.33
C-10	32000.0	0.38
C-11	36000.0	0.42
C-12	41000.0	0.46
C-13	45000.0	0.50
C-14	50000.0	0.54
C-15	57000.0	0.58
C-16	69000.0	0.63
C-17	84000.0	0.67
C-18	109000.0	0.71
C-19	129000.0	0.73
	STPILE.DAT	
A	STEEL PILE FENDER (16 WF 100) WITH A 36 INCH DIAMETER WOOD CAMEL	
B	11	
C-1	0.0	0.0
C-2	50000.0	.012
C-3	100000.0	.024
C-4	150000.0	.036
C-5	200000.0	.048
C-6	250000.0	.060
C-7	300000.0	.072
C-8	350000.0	.084
C-9	380000.0	.091
C-10	400000.0	.096
C-11	425000.0	.102

Appendix D

MOORING LINE ELONGATION FILE

Mooring Line Elongation Data Files

To run the program for a specific mooring line type (MATYPE) a mooring line elongation data file is required. The mooring line elongation data file name is in the general form of MATYPE.DAT where MATYPE is the same mooring line elongation data file name used in FIXMOOR.DAT and explained in data line Type L of FIXMOOR.DAT. Mooring line elongation data files have been set up nylon, polypropylene, and steel mooring lines. Values given are percent elongation for increments of 5% of the mooring lines breaking strength. To set up a data file for a specific mooring line type the following parameters are defined:

Data Line Type A - Mooring line name and description.

Variable	Column	Description
MN	1-80	Mooring line name and description that the user chooses. A maximum of eighty (80) characters is available.

Data Line Type B - Mooring line code number.

Variable	Column	Description
JJ	1-5	Mooring line code number: 0 = Steel 1 = Nylon 2 = Polypropylene The user may define codes larger than 2. A maximum of eleven (11) is permitted.
WSP	6-10	Breaking strength safety factor.

Data Line Type C - Percent elongation values.

Variable	Column	Description
EL	1-10	Percent elongation value for 5% increment of the breaking strength. This data line is omitted for steel mooring lines. With the exception of steel, the first value must be 0.00 and there must be exactly 21 data points in the file, all in even 5% increment of the breaking strength. The breaking strength value is the value entered as BS on data line Type M of FIXMOOR.DAT.

Mooring Line Elongation Files

LINE TYPE	COLUMN 1 2 3 4 5 6 7 8 12345678901234567890123456789012345678901234567890123456789012345678901234567890
	NYLON.DAT MOORING LINE FILE
A	NYLON
B	1 11.0
C-1	0.00
C-2	7.50
C-3	12.50
C-4	13.75
C-5	15.75
C-6	17.50
C-7	19.00
C-8	20.60
C-9	21.90
C-10	23.25
C-11	24.50
C-12	25.75
C-13	26.80
C-14	27.90
C-15	28.90
C-16	29.75
C-17	30.60
C-18	31.50
C-19	32.50
C-20	33.75
C-21	35.50
	POLYPRO.DAT MOORING LINE FILE
A	POLYPROPYLENE
B	2 17.0
C-1	0.00
C-2	3.40
C-3	5.50
C-4	7.25
C-5	8.80
C-6	10.25
C-7	11.50
C-8	12.70
C-9	13.75
C-10	14.80
C-11	15.80
C-12	16.80
C-13	17.80
C-14	18.75
C-15	19.75
C-16	20.50

LINE TYPE	COLUMN 1 12345678901234567890
C-17	21.50
C-18	22.25
C-19	23.10
C-20	23.75
C-21	24.40
	STEEL.DAT MOORING LINE FILE
A	STEEL
B	0 20.0

Appendix E

ENVIRONMENTAL FORCE FILE

Environmental Force File

The user has the option to input the environmental x and y forces and the moment directly for a given ship and environmental conditions by specifying Data Line Type N of FIXMOOR.DAT (NL) to be zero (0). When NL=0 is specified then a FORCE.DAT file must be provided. To set up a FORCE.DAT file the following parameters are defined:

Data Line Type A - Maximum number of load cases + 1.

Variable	Column	Description
NL	1-5	Maximum number of load cases plus a value of 1. For example, if there are 5 load cases to be analyzed, the value to be entered would be 6.

Data Line Type B - Load Cases.

Variable	Column	Description
JZ	1-5	Load case number: This number is the load case plus a value of 1. For example, the load case number for the third load case would be entered as 4.
FL	11-25	*Total surge (longitudinal) force (lb) due to current and wind on the ship.
FT	26-40	*Total sway (lateral) force (lb) due to current and wind on the ship.
FMM	41-55	*Total yaw moment load (ft lb) due to current and wind on the ship.
TX	56-65	Force tolerance value (lb).
TM	66-75	Moment tolerance value (ft lb).

*Note: Be sure the sign convention described in Figure 2 is followed.

FIXMOOR - BETA VERSION

FEEDBACK REPORT

The Naval Civil Engineering Laboratory is fully dedicated to supporting GEMS users. A primary requirement for this task is to establish a priority listing of user requirements. It would be of great value to the development of new software if you, the user, would complete the feedback questions below. Since each individual user may have specific requirements, please reproduce this page as many times as necessary.

Please circle the number that best applies in questions 1 through 4, complete the other questions, fold at tic marks, and mail to NCEL with franked label on reverse side or to address at bottom of page.

1. Was the software beneficial (productive)?

   No benefit 0 1 2 3 4 5 6 7 8 9 10 Very beneficial

2. Was it easy to use (user friendly)?

   Difficult 0 1 2 3 4 5 6 7 8 9 10 Very easy

3. Does this software make decisions more reliable?

   No 0 1 2 3 4 5 6 7 8 9 10 Yes

4. Does it better document the design?

   No 0 1 2 3 4 5 6 7 8 9 10 Yes

5. Did it save time?

   Yes ____ No ____ Estimated percent saved ____

6. What would make future software more user friendly?

7. What further support would you like to have on the GEMS system?

8. What other comments or remarks would you like to add?

Activity____

Telephone____

Mail address is:

NAVFAC GEMS Support Group
Naval Civil Engineering Laboratory
Code L54
Port Hueneme, CA 93043-5003

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